Control of soft manipulator under constraints

Defrost team

Background:
Soft-robotics are compliant to human and they are rightly able to adjust their shapes and flexibilities to suit the task and the environment. Thus, it opens new perspectives in different applications. Due to their compliance, they can access to fragile parts of an environment by applying minimal pressure. However, since soft robot has infinite degree of freedom, the control of such a soft robot is quite challenging. The job of the candidate is to develop algorithm to achieve robust control of soft manipulator under physical or virtual constraints.

Research subject, work plan:
Depending on the different applications, the task space of soft manipulator normally is reduced, due to the existent of constraint. Those constraints might be physical ones which prevent the movement of soft robots in specific direction, or be just virtual one which has been introduced by the user to realize the special task. Therefore, this proposal focuses on the control of soft manipulator under those constraints. The work plan is listed as follows:

1. Familiar with FEM;
2. Deduce the model of soft manipulator and valid it via the simulation (FEM)
3. Introduce different types of constraints (physical or task)
4. Investigate different types of estimators/controllers to control the soft manipulator under those constraints
5. Validations of the proposed algorithms.

Skills:
The candidate must have a master in Robotics or Automatic Control or a related field. French is not necessary but the fluency in English (writing/speaking) is mandatory. Knowledge of C/C++, Python is a plus.

Salary:
1st and 2nd year : 1593.50€ Net monthly salary (after taxes);
3rd year : 1676.31€ Net monthly salary (after taxes)

Contact:
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References:

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[R6] C. Duriez, Control of Elastic Soft Robots based on Real-Time Finite Element Method, IEEE International Conference on Robotics and Automation (ICRA), 2013